

## [12] 实用新型专利说明书

[21] ZL 专利号 02201313.X

[45] 授权公告日 2002 年 12 月 11 日

[11] 授权公告号 CN 2525562Y

[22] 申请日 2002.01.08 [21] 申请号 02201313.X

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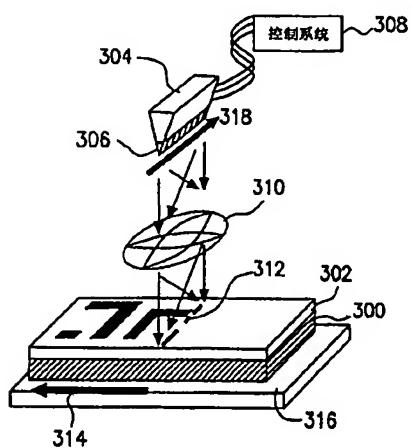
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[54] 实用新型名称 基板曝光装置

[57] 摘要

一种基板曝光装置包括至少一线光源与一控制系统。其中，线光源由多个点光源所组成，而控制系统将图案转换为一时间信号以控制每一个点光源在不同时间的明、灭状态，且控制系统控制扫描光源照射于基材表面的光阻，以使得该光阻曝光。



I S S N 1 0 0 8 - 4 2 7 4

1.一种基板曝光装置，可将一图案转移至一基材表面的一光阻层上，其特征是，该基板曝光装置至少包括：

一光源，该光源配置于距该基材具有该光阻层的表面一特定距离处，该光源包括多个点光源；以及

一扫描控制系统，该扫描控制系统将该图案转换为一依时间变换的信号，以控制每一该些点光源在不同时间的明灭状态，且该控制系统使该基板曝光装置具有扫描功能，可使该光源沿着一扫描路径进行至少一次扫描，使该光阻层曝光。

2.如权利要求 1 所述的基板曝光装置，其特征是，该基材为印刷电路板（PCB）基材。

3.如权利要求 1 所述的基板曝光装置，其特征是，该基材为各式封装基材。

4.如权利要求 1 所述的基板曝光装置，其特征是，该些点光源单排排列以构成一线光源。

5.如权利要求 1 所述的基板曝光装置，其特征是，该些点光源多排排列以构成多个线光源。

6.如权利要求 1 所述的基板曝光装置，其特征是，该些点光源为发光二极管及激光二极管其中之一。

7. 如权利要求 1 所述的基板曝光装置，其特征是，该扫描功能是以移动该光源及该基材其中之一来达成。

8. 如权利要求 1 所述的基板曝光装置，其特征是，该装置更包括一载具以承载该基材。

9. 如权利要求 8 所述的基板曝光装置，其特征是，该扫描功能是以移动该载具来达成。

10. 如权利要求 1 所述的基板曝光装置，其特征是，该装置更包括一透镜组，该透镜组配置于该扫描光源与该基材之间的光行径路线上。

## 基板曝光装置

### 技术领域

本实用新型是有关于一种基板曝光装置，且特别是有关于一种不需要光罩( photo mask )即可将图案( pattern )转移至光阻上的基板曝光装置。

### 背景技术

微影( photolithography )可以说是整个半导体工艺中举足轻重的步骤之一。晶圆的制作中，各层薄膜的图案以及掺杂的区域等都是由微影工艺来决定。因此，我们通常以一个工艺所需要经过的微影次数，即其所需要的光罩数量来衡量这个工艺的复杂程度。进行微影工艺时，必须先将晶圆加温以将其表面上的水分子蒸除，这个步骤称为脱水烘烤( dehydration bake )。接着进行涂底( priming )，适当的涂底可以使晶圆的表面能调整至与光阻的表面能相近，增加光阻于晶圆的附着力。之后才进行光阻涂布、软烤( soft bake )、硬烤( hard bake )等步骤。在晶圆上的光阻经过适当的固化之后，最后再通过曝光( exposure )、显影( development )以将光罩上的图案转移至光阻上。

请参照图 1，其为公知微影工艺通过接触式( contact mode )光罩将图案转移至光阻上的示意图。首先提供一基材( substrate )100，基材 100 上可具有已形成的线路、介电层、介电层图案、或导电层，并

于表面配置有光阻 102。接着将一光罩 110 配置于光阻 102 上。为保护光罩表面，光罩与光组之间以保护膜 104 隔开，保护膜 104 同时与光罩 110 的表面及光阻 102 的表面接触，之后再通过一光源 112 的照射对光阻 102 进行曝光，以将光罩 110 的图案(pattern)转移至光阻 102 上。

公知接触式的光罩 110 架构于一透明基板 106 上，透明基板 106 的一表面上配置有图案化遮蔽层 108。为保护光罩，夹于透明基板 106 及光阻 102 之间的保护层 104，同时与透明基板 106 及光阻 102 的表面接触。其中，光罩 110 上的图案化遮蔽层 108 可将光源 112 遮蔽以决定照射于光阻 102 上的图案上。

接着请参照图 2，其为公知微影工艺通过非接触式( none-contact mode )光罩将图案转移至光阻上的示意图。首先提供一基材(substrate)200，基材 200 上配置有光阻 202。接着将一光罩 210 配置于光阻 202 上方，而在光罩 210 与光阻 202 之间配置一透镜组 214。之后再通过一光源 212 的照射对光阻 202 进行曝光，以将光罩 210 的图案化遮蔽层 208 的图案转移至光阻 202 上在光阻上形成图案 216。

公知非接触式的光罩 210 架构于一透明基板 206 上，透明基板 206 的表面上配置有图案化遮蔽层 208，光罩 210 上的图案化遮蔽层 208 可将光源 212 遮蔽以决定照射于光阻 202 上的图案 216，而光罩 210 是通过透镜组 214 以非接触光阻 202 的方式，将图案转移至光阻 202 上。公知的光罩在制作上十分的费时与昂贵，且光罩必须将其放置在适当的环境中保存，因此光罩在维护上的花费很高。

此外，光罩上的图案并无法更动，因此当晶圆或是印刷电路板上的线路设计有所更动时，必须重新制作适用的光罩。

### 实用新型内容

本实用新型的目的在于提出一种不需要光罩的基板曝光装置，可以降低微影工艺中因光罩制作及保存而产生的成本。

为达本实用新型的目的，提出一种基板曝光装置是由一扫描光源与一控制系统所组成。其中，扫描光源配置于基材上欲进行曝光的光阻上方，而控制系统是用以控制扫描光源或基材沿着一扫描路径移动，并同时将欲形成于光阻上的图案转换为一时间信号，以控制扫描光源在不同时间的明灭状态。

本实用新型的基板曝光装置中，扫描光源由多个点光源所组成，而多个点光源以单排排列的方式而构成一线光源。此外，也可多个点光源以多排排列的方式而构成多条线光源，各个线光源彼此为平行排列，而各个线光源之间沿着其排列的方向可有一特定的位移(*position shift*)，使得每一列线光源中的点光源呈现错位的排列，以提高曝光的分辨率。其中，上述点光源例如为发光二极管、及激光二极管等。

本实用新型的基板曝光装置中，可于扫描光源与光阻之间配置一透镜组，使得扫描光源的光线经由透镜组的调整之后，照射于光阻上达到曝光的目的。

### 附图说明

图 1 为公知的微影工艺通过接触式光罩将图案转移至光阻上的示意图；

图 2 为公知微影工艺通过非接触式光罩将图案转移至光阻上的示意图；

图 3 为依照本实用新型一较佳实施例通过单排排列的点光源于光阻上形成图案的示意图；

图 4 为依照本实用新型一较佳实施例通过多排排列的点光源于光阻上形成图案的示意图；

图 5 为依照本实用新型一较佳实施例通过多排排列的点光源于光阻上形成的扫描路径示意图；

图 6 为依照本实用新型一较佳实施例一种单排排列的点光源于光阻上进行多重扫描的扫描路径示意图；

图 7 为依照本实用新型一较佳实施例另一种单排排列的点光源于光阻上进行多重扫描的扫描路径示意图。

100、200、300：基材

102、202、302：光阻

104：保护层

106、206：透明基板

108、208：图案化遮蔽层

110、210：光罩

112、212：光源

214、310：透镜组

216、312：图案

304：扫描光源

304a、304b、304c、304d：线光源

306：点光源

308：控制系统

314：基材移动方向

316：载具

318：方向

320：扫描路径

P：间距

S：位移

A、B：距离

### 具体实施方式

首先请参照图3，其为依照本实用新型一较佳实施例通过单排排列的点光源于光阻上形成图案的示意图。在进行曝光工艺之前，先提供一表面上配置有光阻302的基材300，基材300上可具有已形成的线路、介电层、介电层图案、或导电层，并将基材300放置于一载具316上。其中，基材300例如为印刷电路板或是各式封装基材。基板曝光装置主要是由扫描光源304以及控制系统308所组成。其中，扫描光源304是由多个点光源306所构成，点光源306是以单排排列的方式构成一线光源304，而线光源的排列方向为方向318。其中，点光源306例如为发光二极管、及激光二极管等。而控制系统308是用以控制承载基材300的载具316沿着基材移动方向314移动，并通过控制系统308将欲形成于光阻302上的图案312转换为一时间信号，

以控制扫描光源 304 在不同时间的明灭状态，进而对光阻 302 进行曝光。此外，在扫描光源 304 与基材 300 之间可配置有一透镜组 310，此透镜组 310 能够将扫描光源 304 的所发出的光线调整（例如图案的缩小、放大、聚焦或散焦等）后照射于光阻 302 上。

同样请参照图 3，载具 316 上的基材 300 沿着基材移动方向 314 移动。控制系统 308 将欲转移至光阻 302 上的图形译码（decode）成一维（one dimension）光点对时间的信号，此一维的时间信号可控制扫描光源 304 中各个点光源 306 在不同时间的明、灭状态。由于基材 300 沿着基材移动方向 314 移动，故基材 300 与扫描光源 304 之间也有一相对运动，因此当扫描光源 304 在不同时间所呈现的明、灭状态，即对应了光阻 302 在不同位置上的曝光与否。经过扫描光源 304 扫描之后，扫描光源 304 会将二维（two dimension）图案 312 转移至光阻 302 上。

接着请参照图 4，其为依照本实用新型一较佳实施例通过多排排列的点光源于光阻上形成图案的示意图。在进行曝光工艺之前，先提供一表面上配置有光阻 302 的基材 300，并将基材 300 放置于一载具 316 上。基板曝光装置主要是由扫描光源 304 以及控制系统 308 所组成。其中，扫描光源 304 是由多个点光源 306 所构成，扫描光源 304 是以多排排列的方式构成多条平行排列的线光源 304a、304b、304c、304d，线光源 304a、304b、304c、304d 的排列方向为方向 318，且线光源 304a、304b、304c、304d 之间沿着方向 318 会有一位移 S（参见图 5），使得每一线光源 304a、304b、304c、304d 中的点光源 306

呈现错位的排列，以提高曝光的分辨率。

控制系统 308 是用以控制承载基材 300 的载具 316 沿着基材移动方向 314 移动，并通过控制系统 308 将欲形成于光阻 302 上的图案 312 转换为一时间信号以控制扫描光源 304 在不同时间的明灭状态，进而对光阻 302 进行曝光。此外，在扫描光源 304 与基材 300 之间例如配置有一透镜组 310，此透镜组 310 能够将扫描光源 304 的所发出的光线调整（例如图案的缩小、放大、聚焦或散焦等）后照射于光阻 302 上。

同样请参照图 4，载具 316 上的基材 300 沿着基材移动方向 314 移动。控制系统 308 将欲转移至光阻 302 上的图形译码成一维的时间信号，此一维的时间信号可控制扫描光源 304 中各个点光源 306 在不同时间的明、灭状态。由于基材 300 沿着基材移动方向 314 移动，故基材 300 与扫描光源 304 之间具有一相对运动，因此当线光源 304a、304b、304c、304d 中的各个点光源 306 在不同时间所呈现的明、灭状态，即对应了光阻 302 在不同位置上的曝光与否。经过扫描光源 304 扫描之后，扫描光源 304 会将二维图案 312 转移至光阻 302 上。

接着请参照图 5，其为依照本实用新型一较佳实施例通过多排排列的点光源于光阻上形成的扫描路径示意图。由图 5 可以清楚得知，点光源 306 以多排排列的方式构成线光源 304a、304b、304c、304d，由于线光源 304a 与线光源 304b 之间在方向 318 上具有一位移 S，此位移 S 为同一线光源中点光源 306 与相邻点光源间的间距 P 的  $1/n$ ，其中 n 为线光源的总数。同样地，线光源 304b 与线光源 304c 之间、

线光源 304c 与线光源 304d 之间在方向 318 上同样也具有位移 S。

通过基材 300 沿着基材移动方向 314 移动，线光源 304a、304b、304c、304d 会沿着扫描路径 230 对光阻 302 进行曝光。各个扫描路径 230 之间的间隔即为位移 S。若以四排线光源 304a、304b、304c、304d 为例，此扫描光源 304 在方向 318 上的分辨率将提升为原先单排排列的 4 倍。

接着请参照图 6，其为依照本实用新型一较佳实施例一种单排排列的点光源于光阻上进行多重扫描的扫描路径示意图。上述图 4 中，将点光源 306 排列成多个线光源 304a、304b、304c、304d 以增进方向 318 上的分辨率。但除了改变点光源 306 的排列方式以外，也可改变扫描光源 304 的扫描方式来达到较佳的分辨率。由图 6 中可以清楚得知，点光源 306 以单排排列的方式排列成一线光源 304，而线光源 304a 沿着方向 318 排列。单一一线光源 304 排列的方向 318 与扫描路径 230 垂直。此外，线光源 304 沿着扫描路径 230 对光阻 302 进行多次的扫描，每一次的扫描的路径都与前一次扫描的路径相差一距离 A，此距离 A 为点光源间距 P 的  $1/n$ ，而 n 为一自然数。

最后请参照图 7，其为依照本实用新型一较佳实施例另一种单排排列的点光源于光阻上进行多重扫描的扫描路径示意图。同样是通过多次扫描对光阻 302 进行曝光，但于图 7 中，利用扫描路径 230 与点光源 306 排列的方向 318 之间的夹角不等于 90 度的方式进行扫描。由于扫描路径 230 与点光源 306 排列的方向 318 之间的夹角不等于 90 度的缘故，相邻扫描路径 230 之间的距离 B 会小于点光源 306 之

间的间距  $P$ ，因此对扫描的分辨率也会有所增进。

上述图 6 与图 7 中，分别以多次扫描以及控制扫描路径与点光源排列的方向之间的夹角不等于 90 度的方式，进一步的增进分辨率。然而，熟悉该项技术的人应可轻易得知，将上述两种方式作适当的结合将可得到更佳的分辨率。

此外，上述图 3 至图 7 中，仅以基材 300 的移动搭配上扫描光源 304 在不同时间的明、灭状态控制，以对光阻 302 进行曝光。然而，基材 300 上光阻 302 与扫描光源 304 之间的相对运动，也可通过扫描光源 304 甚至透镜组 310 的移动或透镜组 310 内部分镜面或透镜的转动或移动来完成。

综上所述，本实用新型的基板曝光装置至少具有下列优点：

1. 本实用新型的基板曝光装置直接将既定的图案以扫描的方式转移至光阻上，可以省去光罩制作的时间。
2. 本实用新型的基板曝光装置可以将各种不同的图案转移至光阻上，不需要针对不同的图案而制作对应的光罩在制作成本上大幅降低。
3. 本实用新型的基板曝光装置中，通过扫描的方式将图案转移至光阻上可使集成电路的自动化量产更为容易。
4. 本实用新型的基板曝光装置可于产品制作的同时，实时修改线路设计，简短开发时间，并使少量多样的客户化个别设计成为可能。
5. 本实用新型的基板曝光装置中，光源与透镜组的相对位置固定不变，使对准位差固定不变（不因更换光罩而改变），使位置定位校

正较为容易。

6.本实用新型的基板曝光装置可省掉所有光罩维护及保存的费用。

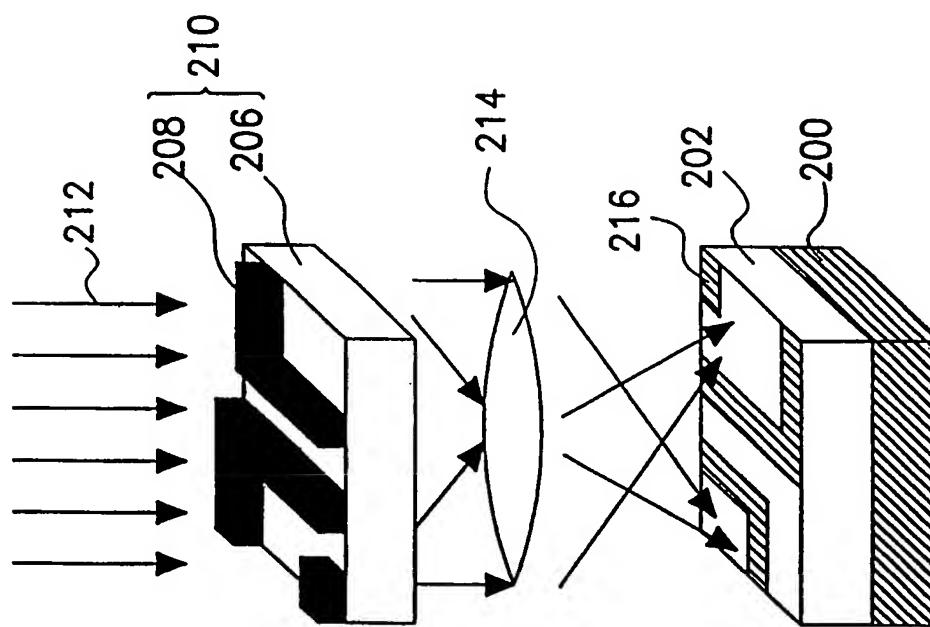


图 2

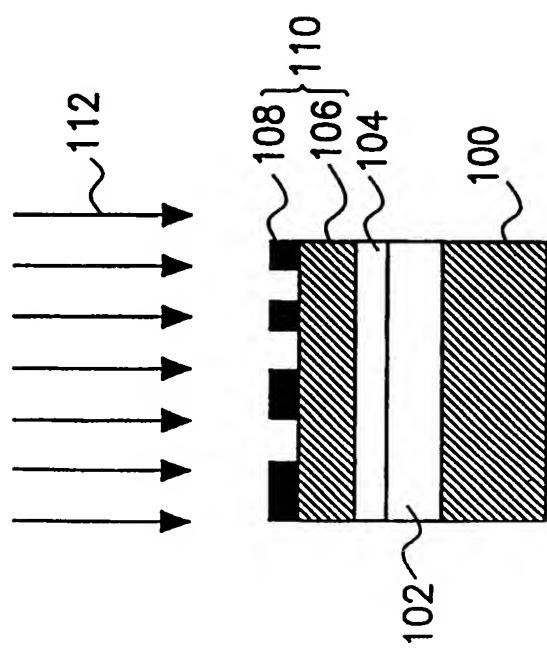


图 1

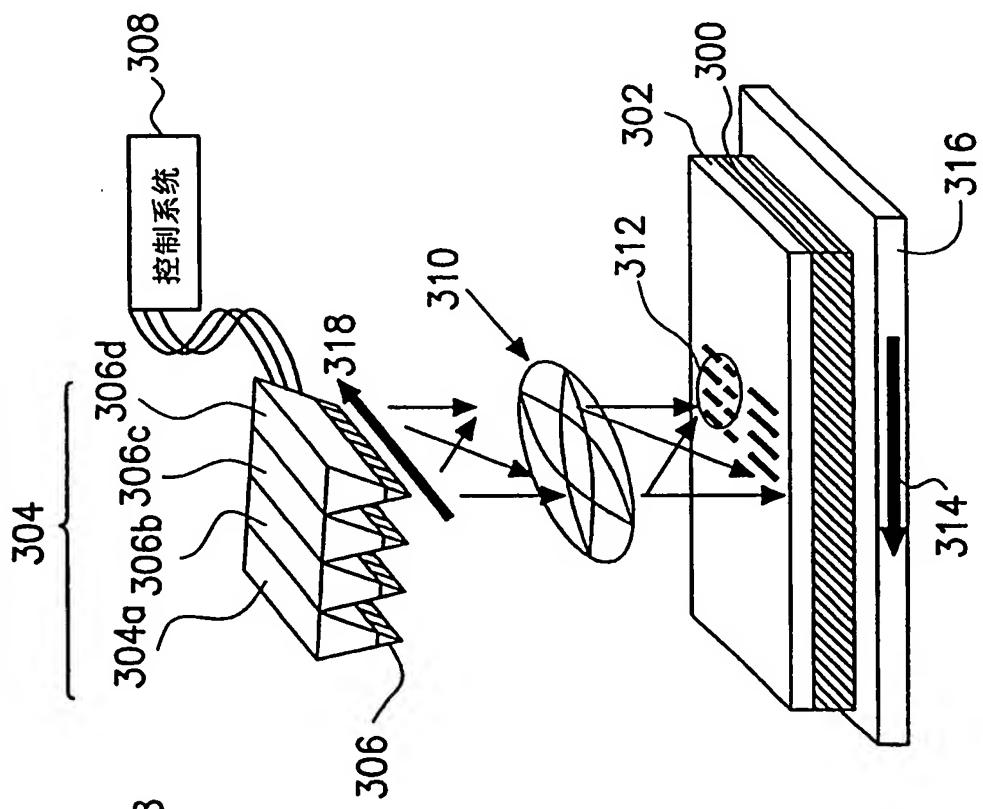


图 4

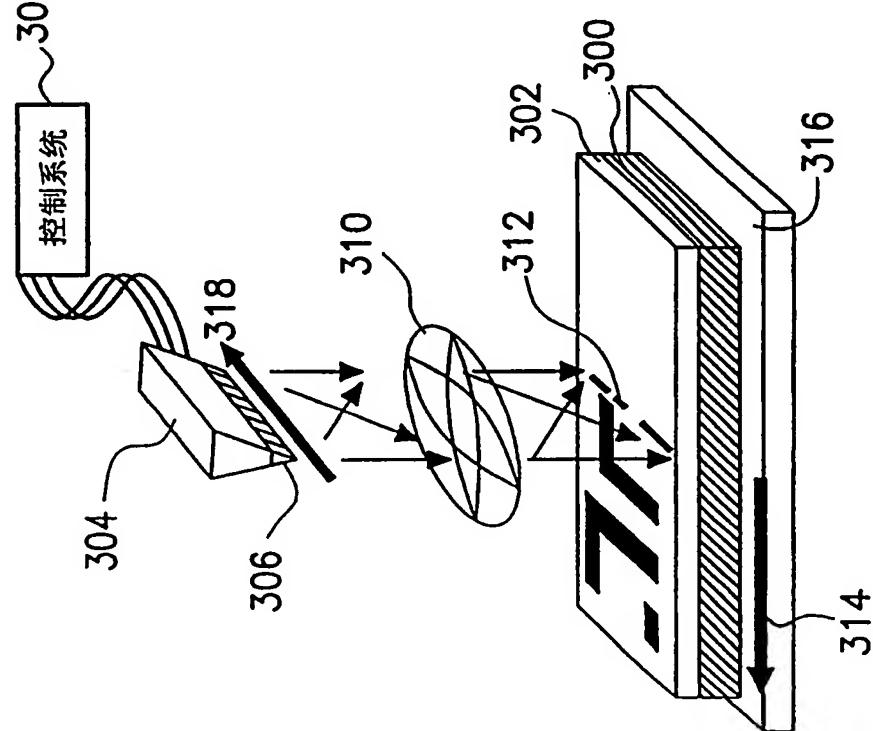


图 3

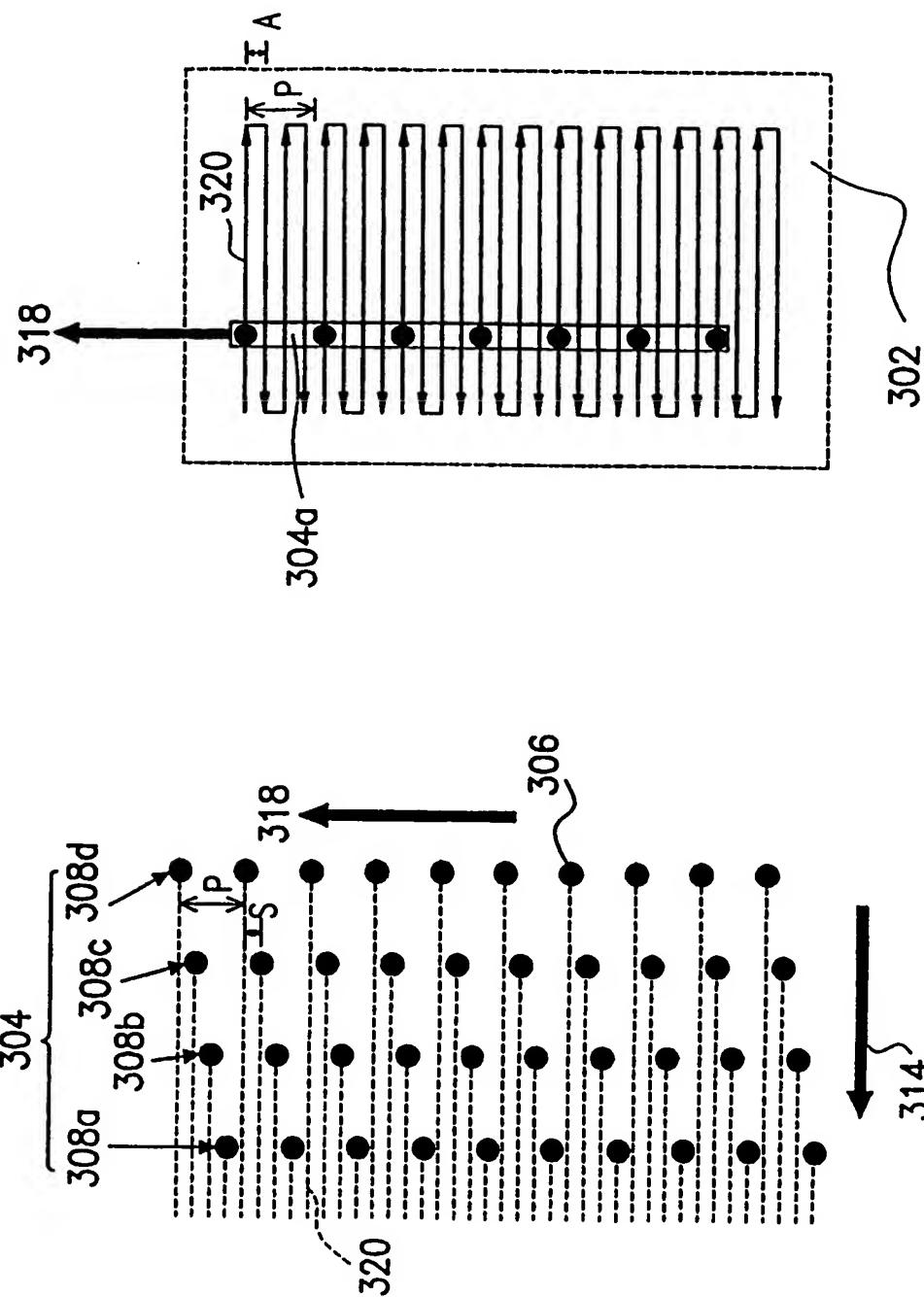


图 5

图 6

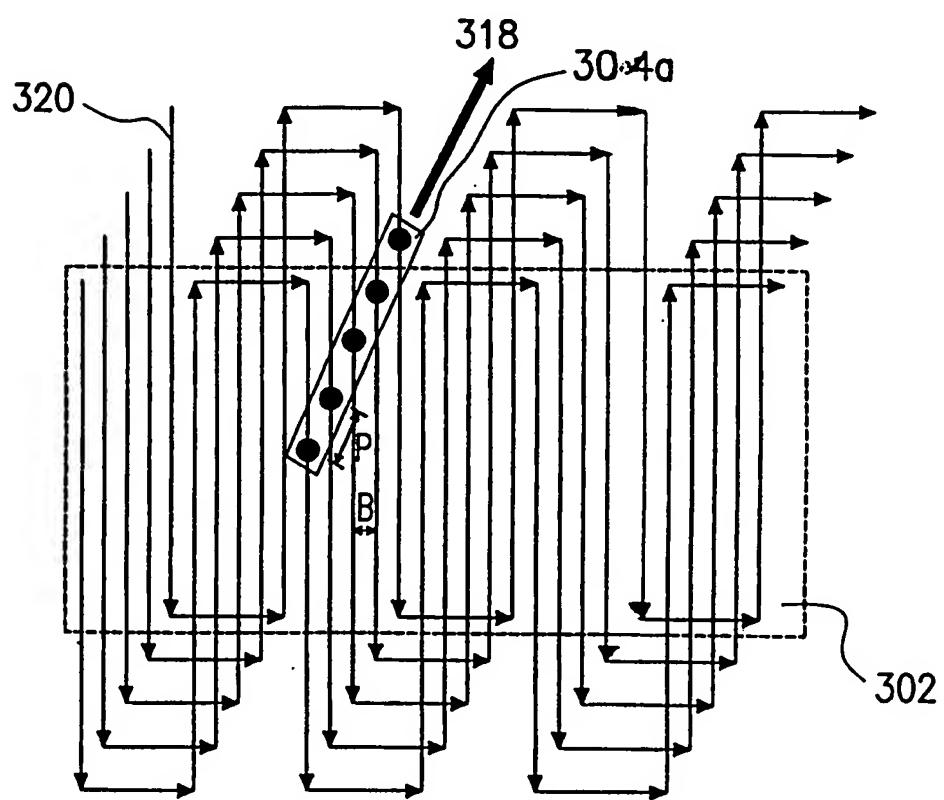


图 7

## Abstract

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The present utility model relates to a base board exposure device comprising a linear light source and a control system. The linear light source is comprised by multiple point light sources. The control system converts a pattern to a time signal for controlling ON/OFF states of each point light sources at different time. And the control system controls scanning light source to irradiate a photo resistance on the substrate's surface so as to expose the photo resistance.

## Claims

1. A base board exposure device for transferring a pattern to a photo resistance layer on a substrate's surface, comprising: a light source comprising multiple point light sources which is disposed at a given distance to said substrate's surface having said photo resistance layer, and a scanning control system which converts said pattern to a time signal for controlling ON/OFF states of each said point light sources at different time and makes said base board exposure device have a scanning function for making said light source scan along a scanning path at least one time, so as to exposure the photo resistance layer.
2. A base board exposure device according to claim 1, wherein said substrate is a printed circuit board substrate.
3. A base board exposure device according to claim 1, wherein said substrate is a packaged substrate of various types.
4. A base board exposure device according to claim 1, wherein said point light sources form one linear light source by single-row arrangement.
5. A base board exposure device according to claim 1, wherein said point light sources form multiple linear light sources by multi-row arrangement.
6. A base board exposure device according to claim 1, wherein said point light sources are light emitting diodes or laser diodes.
7. A base board exposure device according to claim 1, wherein said scanning function is implemented by moving said light source or said substrate.
8. A base board exposure device according to claim 1, wherein said device further comprises a carrier for carrying said substrate.
9. A base board exposure device according to claim 8, wherein said scanning function is implemented by moving said carrier.
10. A base board exposure device according to claim 1, wherein said device further comprises a lens group mounted on a light passing path between said scanning light source and said substrate.

## Description

### BASE BOARD EXPOSURE DEVICE

5

#### TECHNICAL FIELD

The present utility model relates to a base board exposure device, and especially to a base board exposure device which can transfer patterns to photo resistances without photo mask.

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#### BACKGROUND ART

Photolithography is a very important process in whole semi-conductor technics. During the manufacturing of wafer, patterns and doping areas of the film of every layer are determined by photolithography technics. Therefore, we usually measure a technic's complexity by the photolithography times needed or the amount of photo masks needed in the technics. In photolithography technics, a wafer must be heated first so as to vaporize water molecules on its surface. This process is called "dehydration bake". After that comes priming. Appropriate priming can adjust the surface energy of wafers to approach the surface energy of photo resistances so as to improve the adhesions between the wafers and photo resistances. After those are processes such as photo resistance coating, soft bake, and hard bake. At last, the patterns on the photo masks are transferred to the photo resistances by exposure and development after the photo resistances on wafers are solidified appropriately.

FIG. 1 is a diagram showing how a pattern is transferred onto a photo resistance by contact mode photo mask in well known photolithography technics. Refer to FIG. 1, first prepare a substrate 100 which has a circuit, a dielectric layer, a dielectric layer pattern, or an electric conduct layer formed on it, and a photo resistance 102 disposed on its surface. Then dispose a photo mask 110 on the photo resistance 102. To protect the photo mask's surface, the

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photo mask and the photo resistance are separated by a protective layer 104 which contacts with photo mask 110's surface and photo resistance 102's surface at the same time. Then expose the photo resistance 102 by the irradiation of a light source 112 so as to transfer patterns of the photo mask 110 to the photo resistance 102.

The well known contact mode photo mask 110 is built on a transparent base board 106 which has a patterned shielding layer 108 on one surface. The protective layer 104 between the transparent base board 106 and the photo resistance 102 contacts the transparent base board 106's surface and the photo resistance 102's surface at the same time so as to protect the photo mask. And the patterned shielding layer 108 of the photo mask 110 can shield the light source 112 to irradiate the patterns on the photo resistance 102.

FIG. 2 is a diagram showing how a pattern is transferred onto a photo resistance by none-contact mode photo mask in well known photolithography techniques. Refer to FIG. 2, at first, prepare a substrate 200 which has a photo resistance 202. Then dispose a photo mask 210 on the photo resistance 202 and dispose a lens group 214 between the photo mask 210 and the photo resistance 202. Then expose the photo resistance 202 by the irradiation of a light source 212 so as to transfer patterns of the photo mask 210's patterned shielding layer 208 to the photo resistance 202. Then patterns 216 are formed on the photo resistance.

The well known none-contact mode photo mask 210 is built on a transparent base board 206 which has a patterned shielding layer 208 on its surface. The patterned shielding layer 208 of the photo mask 210 can shield the light source 212 so as to determine the patterns 216 irradiated on the photo resistance 202. And the photo mask 210 transfers patterns to the photo resistance 202 by lens group 214 using the none-contact photo resistance 202. It cost a lot of time and money to make the well known photo masks and the photo masks must be preserved in appropriate environment. Therefore the maintenance of photo masks cost a lot.

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Further, patterns on photo masks can't be changed. Appropriate photo masks must be remade when circuit designs on the wafers or the printed circuit boards are changed.

5 SUMMARY OF THE INVENTION

The present utility model has as its object the provision of a base board exposure device which do not need a photo mask so as to decrease the cost of manufacture and maintenance caused by photo masks in photolithography techniques.

10 To realize the above objects, the present utility model relates a base board exposure device comprising a scanning light source and a control system. The scanning light source is disposed above a photo resistance expected to be exposed on a substrate. The control system controls the scanning light source or the substrate to move along a scanning path and converts a pattern expected to be formed on the photo resistance into a time signal for controlling ON/OFF states of each scanning light sources at different time.

15 In the base board exposure device according to the present utility model, the scanning light source comprises multiple point light sources which form one linear light source by single-row arrangement. Alternatively, the multiple point light sources form multiple linear light sources by multi-row arrangement.

20 The linear light sources are parallel to each other. And each two adjacent linear light sources may have a given position shift along the arrangement direction so as to stagger every point light source of every linear light source row to improve exposure resolution. Said point light sources may be light emitting diodes or laser diodes.

25 In the base board exposure device according to the present utility model, a lens group for adjusting the light from the scanning light source may be disposed between the scanning light source and the photo resistance so that the light from the scanning light source irradiates the photo resistance to expose

30 after adjusting.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagram showing how a pattern is transferred onto a photo resistance by contact mode photo mask in well known photolithography techniques.

5 FIG. 2 is a diagram showing how a pattern is transferred onto a photo resistance by none-contact mode photo mask in well known photolithography techniques.

10 FIG. 3 is a diagram showing how single-row point light sources forms patterns on a photo resistance according to a preferred embodiment of the present utility model.

FIG. 4 is a diagram showing how multi-row point light sources forms patterns on a photo resistance according to the preferred embodiment of the present utility model.

15 FIG. 5 is a diagram showing scanning paths on a photo resistance formed by multi-row point light sources according to the preferred embodiment of the present utility model.

20 FIG. 6 is a diagram showing scanning paths on a photo resistance formed by multiple scanning of single-row point light sources according to the preferred embodiment of the present utility model.

FIG. 7 is a diagram showing scanning paths on a photo resistance formed by multiple scanning of another type of single-row point light sources according to the preferred embodiment of the present utility model.

25 100, 200, 300...substrate; 102, 202, 302...photo resistance;  
104...protective layer; 106, 206...transparent base board; 108, 208...patterned  
shielding layer; 110, 210...photo mask; 112, 212...light source; 214,  
310...lens group; 216, 312...pattern; 304...scanning light source; 304a, 304b,  
304c, 304d...linear light source; 306...point light source; 308...control system;  
314...base board moving direction; 316...carrier; 318...direction;  
30 320...scanning path; P...pitch; S...position shift; A, B...distance.

## EMBODIMENTS OF THE INVENTION

FIG. 3 is a diagram showing how single-row point light sources forms patterns on a photo resistance according to a preferred embodiment of the present utility model. Refer to FIG. 3, before exposure process, at first, prepare a substrate 300 which disposed the photo resistance 302 on the surface, the substrate 300 has a circuit, a dielectric layer, a dielectric layer pattern, or an electric conduct layer formed on it, then dispose the substrate 300 on a carrier 316. The substrate 300 is for example a printed circuit board or various packaging substrates. A base board exposure device mainly comprises a scanning light source 304 and a control system 308.

The scanning light source 304 is comprised of multiple point light sources 306. Point light sources 306 form a linear light source 304 by single-row arrangement. The linear light source 304's arrangement direction is direction 318. The point light sources 306 are for example LEDs (light emitting diode) or LDs (laser diode). The control system 308 controls the carrier 316 for carrying the substrate 300 to move along the substrate moving direction 314, converts a pattern 312 expected to be formed on the photo resistance 302 into a time signal so as to control the scanning light source 304's ON/OFF state at different time, and exposes the photo resistance 302. Further, a lens group 310 which can adjust (such as pattern zoom out, zoom in, focus and defocus) the light from the scanning light source 304 and make it irradiate the photo-resistance 302 is disposed between the scanning light source 304 and the substrate 300.

As shown in FIG. 3, the substrate 300 on carrier 316 moves along the substrate moving direction 314. The control system 308 decodes the pattern expected to be transferred to the photo resistance 302 into one dimension lightspot-to-time signals. The one dimension time signals can control the ON/OFF state of each point light source 306 of the scanning light source 304 at different time. There is a relative motion between the substrate 300 and the

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scanning light source 304 because the substrate 300 moves along the substrate moving direction 314. Therefore the scanning light source 304's ON/OFF state at different time corresponds to the photo resistance 302's exposure or not at different positions. After the scanning of the scanning light source 304, the two dimension pattern 312 is transferred to the photo resistance 302 by scanning light source 304.

FIG. 4 is a diagram showing how multi-row point light sources forms patterns on a photo resistance according to the preferred embodiment of the present utility model. Refer to FIG. 4, before exposure, at first, prepare a substrate 300 which has a photo resistance 302 formed on its surface and dispose the substrate 300 on a carrier 316. The base board exposure device mainly comprises a scanning light source 304 and a control system 308. The scanning light source 304 is comprised of multiple point light sources 306. And the scanning light source 304 forms multiple parallel arranged linear light sources 304a, 304b, 304c, and 304d whose arrangement direction is direction 318. There is a position shift S (refer to FIG. 5) between any two adjacent sources of the linear light sources 304a, 304b, 304c, and 304d so as to stagger every point light source 306 among linear light sources 304a, 304b, 304c, and 304d for improving exposure resolution.

The control system 308 controls the carrier 316 for carrying the substrate 300 to move along the substrate moving direction 314, converts a pattern 312 expected to be formed on the photo resistance 302 into a time signal so as to control the scanning light source 304's ON/OFF state at different time, and exposes the photo resistance 302. Further, a lens group 310 which can adjust (such as pattern zoom out, zoom in, focus and defocus) the light from the scanning light source 304 and make it irradiate the photo resistance 302 is disposed between the scanning light source 304 and the substrate 300.

As shown in FIG. 4, the substrate 300 on carrier 316 moves along the substrate moving direction 314. The control system 308 decodes the pattern 312 expected to be transferred to the photo resistance 302 into one dimension time

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signals. The one dimension time signals can control the ON/OFF state of each point source 306 of the scanning light source 304 at different time. There is a relative motion between the substrate 300 and the scanning light source 304 because the substrate 300 moves along the substrate moving direction 314.

5 Therefore, The ON/OFF state of the each point light source 306 of the linear light sources 304a, 304b, 304c, 304d at different time corresponds to the photo resistance 302's exposure or not at different positions. After the scanning of the scanning light source 304, the two dimension pattern 312 is transferred to the photo resistance 302 by the scanning light source 304.

10 Next, refer to FIG. 5. FIG. 5 is a diagram showing scanning paths on a photo resistance formed by multi-row point light sources according to the preferred embodiment of the present utility model. As shown in FIG. 5, point light sources 306 form linear light sources 304a, 304b, 304c, and 304d by multi-row arrangement. Between the linear light sources 304a and 304b, there is a position shift S at the direction 318. And the position shift S is  $1/n$  of the pitch P between a point light source 306 and its adjacent point light source (n is the sum of linear light source). Equally, between the linear light sources 304b and 304c, and between the linear light sources 304c and 304d, there are also position shifts S at the direction 318.

15

20 The linear light sources 304a, 304b, 304c, and 304d expose the photo resistance 302 along the scanning direction 230 by the moving of substrate 300 along the substrate moving direction 314. The pitch between two adjacent scanning paths 230 is the position shift S. Take the 4 rows linear light sources 304a, 304b, 304c, and 304d for example, the resolution at the direction 318 will be enhanced to 4 times of the former single-row arrangement.

25

FIG. 6 is a diagram showing scanning paths on a photo resistance formed by multiple scanning of single-row point light sources according to the preferred embodiment of the present utility model. In said FIG. 4, point light sources 306 are arranged into multiple linear light sources 304a, 304b, 304c, and 304d to enhance the resolution at the direction 318. But besides changing

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the arrangement of point light sources 306, the resolution may also be enhanced by changing the scanning manner. As shown in FIG. 6, the point light sources 306 form one linear light source 304 by single-row arrangement. And the linear light source 304a arranges along the direction 318. The arrangement direction 318 of the single linear light source 304 is vertical to the scanning path 230. The linear light source 304 scans the photo resistance 302 many times along the scanning path 230 and the scanning path each time differs from that of the previous time in a distance A. The distance A is  $1/n$  of the point light source pitch P and n is a natural number.

FIG. 7 is a diagram showing scanning paths on a photo resistance formed by multiple scanning of another type of single-row point light sources according to the preferred embodiment of the present utility model. As shown in FIG. 7, the photo resistance 302 is exposed by multiple scanning in a way that the angle formed by the scanning path 230 and the point light source 306's arrangement direction 318 is not  $90^\circ$ . The distance B between two adjacent scanning paths 230 is smaller than the distance P between two adjacent point light sources 306 because the angle formed by the scanning path 230 and the point light source 306's arrangement direction 318 is not  $90^\circ$ . Therefore, scanning resolution will be enhanced.

As shown in FIG. 6 and FIG. 7, the scanning resolution is enhanced by multiple scanning or controlling the angle between the scanning path and the point light source's arrangement direction 318 not be  $90^\circ$ . But those skilled in the art can easily know that the resolution will be further more enhanced if said two ways are appropriately combined.

Further, as shown in FIG. 3-FIG. 7, the photo resistance 302 is exposed by the movement of the substrate 300 and the ON/OFF control of the scanning light source 304 at different time. But the relative movement between the photo resistance 302 on the substrate 300 and the scanning light source 304 may also be implemented by the scanning light source 304's even the lens group 310's movement or the rotation or movement of partial mirrors or lens

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of the lens group 310.

As described above, the present utility model at least has as its advantages that:

1. The base board exposure device of the present utility model transfers given patterns to the photo resistance directly by scanning, so the time for manufacturing photo mask may be omitted.
2. The base board exposure device of the present utility model can transfer various patterns to the photo resistance and do not need to make corresponding photo masks for different patterns, so the manufacturing cost is greatly decreased.
3. The base board exposure device of the present utility model transfers patterns to the photo resistance by scanning, so the automatic volume production of the integrated circuit becomes easier.
4. The base board exposure device of the present utility model can modify circuit designs in real time, decrease development time, and realize a small-volume, large-variety customized manufacture while being applied in product manufacture.
5. The relative position between the light source and the lens group of the base board exposure device according to the present utility model is changeless, so the collimating potential difference is changeless (will not be changed because of the replacing of the photo mask) and the locating collimation becomes easier.
6. The base board exposure device of the present utility model can omit all the costs caused by the maintenance and preservation of photo masks.

25

Drawings

FIG. 3, 4

308: control system